

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2000-124197

(43)Date of publication of application : 28.04.2000

(51)Int.Cl.

H01L 21/3065

B01J 19/08

H05H 1/46

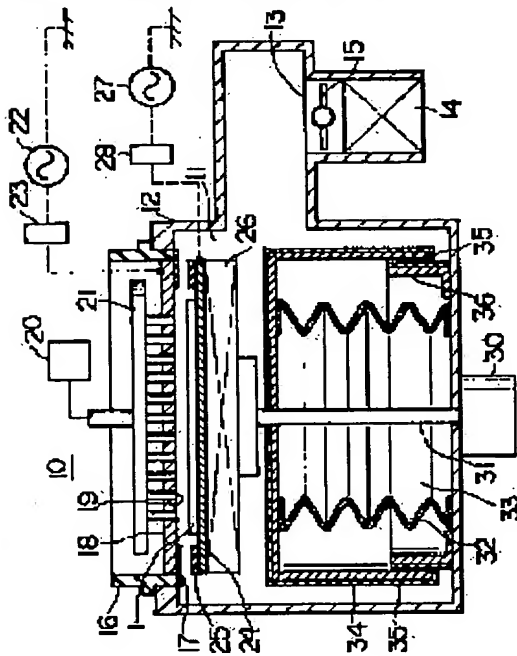
(21)Application number : 10-295128

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(22)Date of filing : 16.10.1998

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## (54) PLASMA TREATMENT APPARATUS



(57)Abstract:

**PROBLEM TO BE SOLVED:** To prevent contamination generated from a cover.

**SOLUTION:** A vertically moving shaft 31 of a vertically moving device 30, which causes vertical movement of a lower electrode 24, is inserted into the bottom wall of a chamber 12 in a treatment chamber 11, and the vertically moving shaft 31 supports the lower electrode 24 on the upper end, and a heater 26 is supported from the lower side. A cover 34, covering a bellows 32, is attached to the upper end part of the vertically moving shaft 31, the cover 34 of aluminium or alumite is formed into a cylindrical shape. A polyimide resin (protective sheet) 35 is adhered to the cover 34. With such a construction, since the generation of contamination can be prevented by the protective sheet with the cover being etched, the lowering of the production yield

for wafers due to the adhesion of contamination can be prevented. Since the replacement work, the cleaning work and the surface processing work of the cover can be omitted, the maintenance of a dry etching apparatus can be simplified and operation rate of the dry etching apparatus is increased.

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## CLAIMS

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### [Claim(s)]

[Claim 1] Plasma treatment equipment characterized by covering with the etching prevention section the front face of covering which covers the tooth-back space of an electrode.

[Claim 2] Plasma treatment equipment according to claim 1 characterized by forming said etching prevention section with polyimide system resin.

[Claim 3] Plasma treatment equipment according to claim 1 characterized by forming said etching prevention section with the quartz.

[Claim 4] Plasma treatment equipment according to claim 1, 2, or 3 characterized by being constituted with the sheet which said etching prevention section pasted up on the front face of said covering.

[Claim 5] Plasma treatment equipment according to claim 1, 2, or 3 characterized by said whole covering being said etching prevention section.

[Claim 6] Plasma treatment equipment according to claim 1, 2, 3, 4, or 5 characterized by forming said covering of aluminum or alumite.

[Claim 7] Plasma treatment equipment according to claim 1, 2, 3, 4, 5, or 6 characterized by carrying out dry etching by the plasma which said electrode formed.

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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention is used for performing etching processing to a wafer in the production process of a semiconductor device, concerning a plasma treatment technique and the pollution-control technique according to a foreign matter especially, and relates to an effective technique.

[0002]

[Description of the Prior Art] In the production process of a semiconductor device, as a dry etching system which performs etching processing to the thin film on a wafer, a wafer is held with the lower electrode of the parallel plate electrode arranged up and down, and there are some which are constituted so that etching processing may be performed by the etching reaction by the plasma formed between two electrodes and the etching gas supplied to a processing room.

[0003] As this conventional seed dry etching system, the lifting device for making the lower part space of a lower electrode go up and down a lower electrode etc. is furnished, and in order to prevent that this lifting device etc. is polluted with etching gas or a resultant, there are some to which covering which covers a lifting device etc. is furnished. Generally, since there is little effect to dry etching processing or wafer contamination, aluminum and alumite are used and this covering is manufactured.

[0004] As an example which has expressed the dry etching technique, they are Kogyo Chosakai Publishing Co., Ltd. 1997 year 11 month 25 day issue "electronic ingredient November, 1997 issue separate volume" P88-P92 and \*\*\*\*\*.

[0005]

[Problem(s) to be Solved by the Invention] However, in the above mentioned dry etching system, since covering was etched when the plasma which changes with processings of dry etching concentrates on covering, it was shown clearly by this

invention person that there was a trouble that the foreign matter which used the component of covering as the principal component is generated. The generated foreign matter adheres on a wafer and causes [ of the yield of a product ] a fall. Moreover, since the generated foreign matter adheres to the wall surface of a processing room, or an internal component part and is deposited, it makes the frequency of those washing and exchange increase, and causes [ of a dry etching system ] an operating ratio fall.

[0006] The purpose of this invention is to offer the plasma treatment technique in which generating of the foreign matter which makes covering a generation source can be prevented.

[0007] The other purposes and the new description will become clear from description and the accompanying drawing of this specification along [ said ] this invention.

[0008]

[Means for Solving the Problem] It will be as follows if the outline of a typical thing is explained among invention indicated in this application.

[0009] That is, plasma treatment equipment is characterized by covering with the etching prevention section the front face of covering which covers the tooth-back space of an electrode.

[0010] Since according to the above mentioned means etching of covering is not generated even if the plasma concentrates on the etching prevention section which covered the front face of covering, generating of contamination by the foreign matter from covering can be prevented.

[0011]

[Embodiment of the Invention] Drawing 1 is the transverse-plane sectional view showing the dry etching system which is 1 operation gestalt of this invention.

Drawing 2 is the expansion fragmentary sectional view of the principal part.

[0012] In this operation gestalt, the plasma treatment equipment concerning this invention is constituted as a dual tone multifrequency parallel monotonous form oxide film dry etching system. The dry etching system 10 is equipped with the chamber 12 which constitutes the processing room 11 for processing the wafer 1 as a processed material, and the chamber 12 is formed in the shape of [ which stainless steel etc. was used, the top face carried out opening, and the inferior surface of tongue blockaded ] a cylindrical shape. The exhaust port 13 is formed in the side attachment wall of a chamber 12, and the exhauster 14 is connected to the exhaust port 13 through the closing motion valve 15.

[0013] The counterelectrode section 16 is put on upper limit opening of a chamber 12, it shuts up in the inferior-surface-of-tongue periphery section of the counterelectrode section 16 the side after consisting of insulating materials, such as a quartz and a ceramic, and the ring 17 is installed in it. It shuts up the counterelectrode section 16 top side, and the up electrode 18 is installed in the ring 17 bottom. Two or more gas supply openings 19 are established by the up electrode 18, and the gas transfer unit 20 is connected to these gas supply opening 19 through the gas supply way 21. RF generator 22 is connected to the up electrode 18 through the adjustment machine 23. For example, by impressing a dozens of MHz RF, RF generator 22 is set up so that a plasma consistency may mainly be controlled.

[0014] The lower electrode 24 which goes up and down with a lifting device 30 is installed in the interior of the processing room 11 of a chamber 12, and the top face of the lower electrode 24 is constituted so that it can hold, where a wafer 1 is stuck. It shuts up in the periphery section of the lower electrode 24 the bottom side formed of insulating materials, such as a quartz and a ceramic, and the ring 25 is installed, it

shuts up a bottom side, and the ring 25 is constituted so that the plasma is shut up a top side, and it may collaborate with a ring 17 and may shut up in the headroom of a wafer 1.

[0015] The lower electrode 24 is equipped with the heater 26, and a heater 26 heats the wafer 1 which the lower electrode 24 held. Second RF generator 27 is connected to the lower electrode 24 through the second adjustment machine 28. For example, by impressing several MHz high frequency, second RF generator 27 is set up so that bias may mainly be controlled.

[0016] The rise-and-fall shaft 31 of the lifting device 30 which makes it go up and down the lower electrode 24 is inserted in the bottom wall of a chamber 12 from the bottom, and supports the lower electrode 24 and a heater 26 from the bottom by upper limit. The covering 34 which covered bellows 32 is attached in the upper limit section of the rise-and-fall shaft 31. Covering 34 follows rise and fall of the rise-and-fall shaft 31, and goes up and down, rise and fall of the rise-and-fall shaft 31 are followed, and a centrum 33 is expanded [ bellows 32 ] and contracted, while expansion contraction is carried out. Rubber, resin, or a metal is used, and bellows 32 is formed in the circular bellows configuration, and carries out the protection against dust of the surroundings of the rise-and-fall shaft 31 which inserted in the inside of a centrum 33.

[0017] Aluminum or alumite was used, and rather than bellows 32, covering 34 was formed in the shape of [ of a major diameter ] a cylindrical shape, was arranged on bellows 32 and a concentric circle, and has covered bellows 32. The peripheral face of covering 34 is pasted so that the polyimide resin sheet (henceforth a protection sheet) 35 which constitutes the etching prevention section may cover the whole surface. The protection sheet 35 is pasted up on covering 34 so that it can exfoliate, since it is thinly formed so that spacing with the inner skin of the processing room 11 may be made large, and it is exchangeable.

[0018] On the bottom wall of the processing room 11, it is installed so that the guide cylinder 36 may approach inside covering 34 and the peripheral face may approach the inner skin of covering 34, and it shows the guide cylinder 36 to rise and fall of covering 34. The protection sheet 35 has also pasted the peripheral face of the guide cylinder 36.

[0019] The dry etching processing in the dry etching system concerning the above configuration is explained.

[0020] The lower electrode 24 descends with a lifting device 30, and if the wafer 1 transferred on the lower electrode 24 by the handling device is held with the lower electrode 24, the lower electrode 24 will go up with a lifting device 30. Under the present circumstances, spacing of the up electrode 18 and the lower electrode 24 is set as narrow spacing of about 20mm.

[0021] Next, evacuation of the processing room 11 is carried out by the exhaustor 14, and etching gas is supplied to homogeneity from the gas supply opening 19 over the whole to a wafer 1 through the gas supply way 21 by the gas transfer unit 20. as etching gas -- CF<sub>4</sub>, CHF<sub>3</sub>, and C four F<sub>8</sub> etc. -- in order SUKABENJI [ to use fluorocarbon system gas, if needed, to add inert gas, such as Ar and helium, in order to balance a lengthwise direction, and / a deposition kind ] -- CO, O<sub>2</sub>, and N<sub>2</sub> etc. -- gas is added. The internal pressure of the processing room 11 is set as about 0.5-100Pa. The upper and lower sides shut up etching gas, and it is exhausted through the clearance between rings 17 and 25.

[0022] When high-frequency power is impressed to the up electrode 18 and the lower electrode 24 by RF generators 22 and 27 in this condition, the plasma is formed between the up electrode 18 and the lower electrode 24, and it is SiO<sub>2</sub> of a wafer 1.

The film, the SiN film, etc. are etched by the reaction of etching gas.

[0023] That electric field are built between the up electrode 18 and the lower electrode 24, and when the upper and lower sides shut up and spacing with rings 17 and 25 is about 12-13mm, the upper and lower sides shut up and it will be formed by the plasma focusing on the inside of rings 17 and 25. Thus, when the plasma concentrates between the up electrode 18 and the lower electrode 24, the plasma of high density will be formed.

[0024] If desired etching processing is performed to a wafer 1, the lower electrode 24 will descend with a lifting device 30, a wafer 1 will be taken up by the handling device, and it will be taken out to the exterior of the processing room 11, and will go. Henceforth, by repeating the above mentioned actuation, etching processing is carried out and one wafer 1 goes at a time.

[0025] By the way, although the plasma is concentrated and formed in the narrow space between the up electrode 18 and the lower electrode 24, the plasma may be formed in the installation space of covering of fluctuation of the exhaust air conditions of an exhauster 14, the conditions of supply of etching gas, and a plasma ambient atmosphere etc., and the aluminum side and alumite side which covering exposed may be etched. If aluminum and alumite are etched by the gas of a fluorocarbon system, aluminum fluoride (AlF) will be generated as a foreign matter (particle). If this foreign matter adheres to a wafer, the yield will fall. Although it adheres and deposits on a processing room or the front face of covering, since this foreign matter tends to exfoliate, the re entrainment of it is carried out and it adheres to a wafer.

[0026] However, in this operation gestalt, since the front face of covering 34 is covered with the protection sheet 35 formed with polyimide system resin, even if it is etched by the fluorocarbon system gas under the plasma generated to the installation space of covering 34, although only a minute amount is generated extremely, the foreign matter of AlF does not generate the resultant of carbon or fluorine. Even if the resultant of carbon or fluorine was generated, this foreign matter adheres to the front face of the protection sheet 35, and it is easy to deposit it, and since the deposited foreign matter cannot exfoliate easily, the re entrainment of it is not carried out. That is, since the foreign matter of the resultant from the protection sheet 35 is immediately caught by the protection sheet 35, it does not turn into a foreign matter which pollutes a wafer 1.

[0027] And if a foreign matter accumulates on the protection sheet 35 to some extent, the protection sheet 35 will exfoliate from covering 34, and will be exchanged for a new thing. Therefore, washing of covering 34 can control abolition or frequency very low.

[0028] According to said operation gestalt, the following effectiveness is acquired.

[0029] 1) Since it can prevent that the aluminum or the alumite of covering is etched and a foreign matter is generated by covering the front face of covering with the protection sheet formed with polyimide system resin, the fall of the quality and reliability of the dry etching processing by the foreign matter can be prevented, and the yield fall of the wafer by adhesion of the foreign matter can be prevented.

[0030] 2) Since exchange, washing, and the surface treatment activity of covering are omissible by preventing that the front face of covering is etched, the maintenance of a dry etching system can be simplified and the operating ratio of a dry etching system can be increased.

[0031] 3) Since exchange, washing, and the surface treatment activity of covering can be transposed to exchange of a protection sheet by constituting a protection sheet

exchangeable, the maintenance of a dry etching system can be simplified and the operating ratio of a dry etching system can be increased.

[0032] 4) Since ingredient costs, processing costs, and costs with a group can be reduced by forming the etching prevention section with a protection sheet, the increment in cost can be controlled.

[0033] 5) It can prevent that the plasma becomes is easy to be formed when spacing becomes narrow since a protection sheet can avoid that spacing with a processing indoor peripheral surface becomes narrow according to a thin thing.

[0034] Although invention made by this invention person above was concretely explained based on the operation gestalt, it cannot be overemphasized that it can change variously in the range which this invention is not limited to said operation gestalt, and does not deviate from the summary.

[0035] For example, the etching prevention section may be constituted by not restricting for constituting so that the protection sheet formed with polyimide system resin may be pasted up on covering and the front face of covering may be covered with the etching prevention section, but forming the whole covering with polyimide resin. Although cost will increase compared with the case where a protection sheet is used if the whole covering is formed with polyimide resin, contamination of the wafer by the foreign matter can be prevented.

[0036] The etching prevention section may not be restricted for forming with polyimide system resin, but may be formed with a quartz. When the etching prevention section is formed with a quartz, it is SiO<sub>2</sub> by etching. Although a foreign matter is generated, generation of the foreign matter of AlF can be prevented. To form the etching prevention section with a quartz, it is necessary to consider that spacing with a processing indoor peripheral surface becomes narrow, and the plasma becomes is easy to be formed.

[0037] Although the above explanation explained the case where invention mainly made by this invention person was applied to the dry etching technique which is a field of the invention used as the background, it is not limited to it and can apply to plasma treatment technical [ at large one, such as a plasma-CVD technique, and a plasma ashing technique, a sputtering technique, ].

[0038]

[Effect of the Invention] It will be as follows if the effectiveness acquired by the typical thing among invention indicated in this application is explained briefly.

[0039] Since it can prevent that covering is etched and a foreign matter is generated by covering the front face of covering with the etching prevention section, the fall of the quality and reliability of the plasma treatment by adhesion of the foreign matter can be prevented.

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## TECHNICAL FIELD

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[Field of the Invention] This invention is used for performing etching processing to a wafer in the production process of a semiconductor device, concerning a plasma treatment technique and the pollution-control technique according to a foreign matter especially, and relates to an effective technique.

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## PRIOR ART

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[Description of the Prior Art] In the production process of a semiconductor device, as a dry etching system which performs etching processing to the thin film on a wafer, a wafer is held with the lower electrode of the parallel plate electrode arranged up and down, and there are some which are constituted so that etching processing may be performed by the etching reaction by the plasma formed between two electrodes and the etching gas supplied to a processing room.

[0003] As this conventional seed dry etching system, the lifting device for making the lower part space of a lower electrode go up and down a lower electrode etc. is furnished, and in order to prevent that this lifting device etc. is polluted with etching gas or a resultant, there are some to which covering which covers a lifting device etc. is furnished. Generally, since there is little effect to dry etching processing or wafer contamination, aluminum and alumite are used and this covering is manufactured.

[0004] As an example which has expressed the dry etching technique, they are Kogyo Chosakai Publishing Co., Ltd. 1997 year 11 month 25 day issue "electronic ingredient November, 1997 issue separate volume" P88-P92 and \*\*\*\*\*.

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## EFFECT OF THE INVENTION

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[0039] Since it can prevent that covering is etched and a foreign matter is generated by covering the front face of covering with the etching prevention section, the fall of the quality and reliability of the plasma treatment by adhesion of the foreign matter can be prevented.

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## TECHNICAL PROBLEM

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[Problem(s) to be Solved by the Invention] However, in the above mentioned dry etching system, since covering was etched when the plasma which changes with processings of dry etching concentrates on covering, it was shown clearly by this invention person that there was a trouble that the foreign matter which used the component of covering as the principal component is generated. The generated foreign matter adheres on a wafer and causes [ of the yield of a product ] a fall. Moreover, since the generated foreign matter adheres to the wall surface of a processing room, or an internal component part and is deposited, it makes the frequency of those washing and exchange increase, and causes [ of a dry etching system ] an operating ratio fall.

[0006] The purpose of this invention is to offer the plasma treatment technique in which generating of the foreign matter which makes covering a generation source can be prevented.

[0007] The other purposes and the new description will become clear from description and the accompanying drawing of this specification along [ said ] this invention.

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## MEANS

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[Means for Solving the Problem] It will be as follows if the outline of a typical thing is explained among invention indicated in this application.

[0009] That is, plasma treatment equipment is characterized by covering with the etching prevention section the front face of covering which covers the tooth-back space of an electrode.

[0010] Since according to the above mentioned means etching of covering is not generated even if the plasma concentrates on the etching prevention section which covered the front face of covering, generating of contamination by the foreign matter from covering can be prevented.

[0011]

[Embodiment of the Invention] Drawing 1 is the transverse-plane sectional view showing the dry etching system which is 1 operation gestalt of this invention.

Drawing 2 is the expansion fragmentary sectional view of the principal part.

[0012] In this operation gestalt, the plasma treatment equipment concerning this invention is constituted as a dual tone multifrequency parallel monotonous form oxide film dry etching system. The dry etching system 10 is equipped with the chamber 12 which constitutes the processing room 11 for processing the wafer 1 as a processed material, and the chamber 12 is formed in the shape of [ which stainless steel etc. was used, the top face carried out opening, and the inferior surface of tongue blockaded ] a cylindrical shape. The exhaust port 13 is formed in the side attachment wall of a chamber 12, and the exhauster 14 is connected to the exhaust port 13 through the closing motion valve 15.

[0013] The counterelectrode section 16 is put on upper limit opening of a chamber 12, it shuts up in the inferior-surface-of-tongue periphery section of the counterelectrode section 16 the side after consisting of insulating materials, such as a quartz and a ceramic, and the ring 17 is installed in it. It shuts up the counterelectrode section 16 top side, and the up electrode 18 is installed in the ring 17 bottom. Two or more gas supply openings 19 are established by the up electrode 18, and the gas transfer unit 20 is connected to these gas supply opening 19 through the gas supply way 21. RF generator 22 is connected to the up electrode 18 through the adjustment machine 23. For example, by impressing a dozens of MHz RF, RF generator 22 is set up so that a plasma consistency may mainly be controlled.

[0014] The lower electrode 24 which goes up and down with a lifting device 30 is installed in the interior of the processing room 11 of a chamber 12, and the top face of the lower electrode 24 is constituted so that it can hold, where a wafer 1 is stuck. It shuts up in the periphery section of the lower electrode 24 the bottom side formed of insulating materials, such as a quartz and a ceramic, and the ring 25 is installed, it shuts up a bottom side, and the ring 25 is constituted so that the plasma is shut up a top side, and it may collaborate with a ring 17 and may shut up in the headroom of a wafer 1.

[0015] The lower electrode 24 is equipped with the heater 26, and a heater 26 heats the wafer 1 which the lower electrode 24 held. Second RF generator 27 is connected to the lower electrode 24 through the second adjustment machine 28. For example, by impressing several MHz high frequency, second RF generator 27 is set up so that bias may mainly be controlled.

[0016] The rise-and-fall shaft 31 of the lifting device 30 which makes it go up and down the lower electrode 24 is inserted in the bottom wall of a chamber 12 from the bottom, and supports the lower electrode 24 and a heater 26 from the bottom by upper limit. The covering 34 which covered bellows 32 is attached in the upper limit section of the rise-and-fall shaft 31. Covering 34 follows rise and fall of the rise-and-fall shaft 31, and goes up and down, rise and fall of the rise-and-fall shaft 31 are followed, and a centrum 33 is expanded [ bellows 32 ] and contracted, while expansion contraction



is carried out. Rubber, resin, or a metal is used, and bellows 32 is formed in the circular bellows configuration, and carries out the protection against dust of the surroundings of the rise-and-fall shaft 31 which inserted in the inside of a centrum 33. [0017] Aluminum or alumite was used, and rather than bellows 32, covering 34 was formed in the shape of [ of a major diameter ] a cylindrical shape, was arranged on bellows 32 and a concentric circle, and has covered bellows 32. The peripheral face of covering 34 is pasted so that the polyimide resin sheet (henceforth a protection sheet) 35 which constitutes the etching prevention section may cover the whole surface. The protection sheet 35 is pasted up on covering 34 so that it can exfoliate, since it is thinly formed so that spacing with the inner skin of the processing room 11 may be made large, and it is exchangeable.

[0018] On the bottom wall of the processing room 11, it is installed so that the guide cylinder 36 may approach inside covering 34 and the peripheral face may approach the inner skin of covering 34, and it shows the guide cylinder 36 to rise and fall of covering 34. The protection sheet 35 has also pasted the peripheral face of the guide cylinder 36.

[0019] The dry etching processing in the dry etching system concerning the above configuration is explained.

[0020] The lower electrode 24 descends with a lifting device 30, and if the wafer 1 transferred on the lower electrode 24 by the handling device is held with the lower electrode 24, the lower electrode 24 will go up with a lifting device 30. Under the present circumstances, spacing of the up electrode 18 and the lower electrode 24 is set as narrow spacing of about 20mm.

[0021] Next, evacuation of the processing room 11 is carried out by the exhauster 14, and etching gas is supplied to homogeneity from the gas supply opening 19 over the whole to a wafer 1 through the gas supply way 21 by the gas transfer unit 20. as etching gas --  $\text{CF}_4$ ,  $\text{CHF}_3$ , and  $\text{C}_4\text{F}_8$  etc. -- in order SUKABENJI [ to use fluorocarbon system gas, if needed, to add inert gas, such as Ar and helium, in order to balance a lengthwise direction, and / a deposition kind ] --  $\text{CO}$ ,  $\text{O}_2$ , and  $\text{N}_2$  etc. -- gas is added. The internal pressure of the processing room 11 is set as about 0.5-100Pa. The upper and lower sides shut up etching gas, and it is exhausted through the clearance between rings 17 and 25.

[0022] When high-frequency power is impressed to the up electrode 18 and the lower electrode 24 by RF generators 22 and 27 in this condition, the plasma is formed between the up electrode 18 and the lower electrode 24, and it is  $\text{SiO}_2$  of a wafer 1. The film, the  $\text{SiN}$  film, etc. are etched by the reaction of etching gas.

[0023] That electric field are built between the up electrode 18 and the lower electrode 24, and when the upper and lower sides shut up and spacing with rings 17 and 25 is about 12-13mm, the upper and lower sides shut up and it will be formed by the plasma focusing on the inside of rings 17 and 25. Thus, when the plasma concentrates between the up electrode 18 and the lower electrode 24, the plasma of high density will be formed.

[0024] If desired etching processing is performed to a wafer 1, the lower electrode 24 will descend with a lifting device 30, a wafer 1 will be taken up by the handling device, and it will be taken out to the exterior of the processing room 11, and will go. Henceforth, by repeating the above mentioned actuation, etching processing is carried out and one wafer 1 goes at a time.

[0025] By the way, although the plasma is concentrated and formed in the narrow space between the up electrode 18 and the lower electrode 24, the plasma may be formed in the installation space of covering of fluctuation of the exhaust air

conditions of an exhauster 14, the conditions of supply of etching gas, and a plasma ambient atmosphere etc., and the aluminum side and alumite side which covering exposed may be etched. If aluminum and alumite are etched by the gas of a fluorocarbon system, aluminum fluoride (AlF) will be generated as a foreign matter (particle). If this foreign matter adheres to a wafer, the yield will fall. Although it adheres and deposits on a processing room or the front face of covering, since this foreign matter tends to exfoliate, the re entrainment of it is carried out and it adheres to a wafer.

[0026] However, in this operation gestalt, since the front face of covering 34 is covered with the protection sheet 35 formed with polyimide system resin, even if it is etched by the fluorocarbon system gas under the plasma generated to the installation space of covering 34, although only a minute amount is generated extremely, the foreign matter of AlF does not generate the resultant of carbon or fluorine. Even if the resultant of carbon or fluorine was generated, this foreign matter adheres to the front face of the protection sheet 35, and it is easy to deposit it, and since the deposited foreign matter cannot exfoliate easily, the re entrainment of it is not carried out. That is, since the foreign matter of the resultant from the protection sheet 35 is immediately caught by the protection sheet 35, it does not turn into a foreign matter which pollutes a wafer 1.

[0027] And if a foreign matter accumulates on the protection sheet 35 to some extent, the protection sheet 35 will exfoliate from covering 34, and will be exchanged for a new thing. Therefore, washing of covering 34 can control abolition or frequency very low.

[0028] According to said operation gestalt, the following effectiveness is acquired.

[0029] 1) Since it can prevent that the aluminum or the alumite of covering is etched and a foreign matter is generated by covering the front face of covering with the protection sheet formed with polyimide system resin, the fall of the quality and reliability of the dry etching processing by the foreign matter can be prevented, and the yield fall of the wafer by adhesion of the foreign matter can be prevented.

[0030] 2) Since exchange, washing, and the surface treatment activity of covering are omissible by preventing that the front face of covering is etched, the maintenance of a dry etching system can be simplified and the operating ratio of a dry etching system can be increased.

[0031] 3) Since exchange, washing, and the surface treatment activity of covering can be transposed to exchange of a protection sheet by constituting a protection sheet exchangeable, the maintenance of a dry etching system can be simplified and the operating ratio of a dry etching system can be increased.

[0032] 4) Since ingredient costs, processing costs, and costs with a group can be reduced by forming the etching prevention section with a protection sheet, the increment in cost can be controlled.

[0033] 5) It can prevent that the plasma becomes is easy to be formed when spacing becomes narrow since a protection sheet can avoid that spacing with a processing indoor peripheral surface becomes narrow according to a thin thing.

[0034] Although invention made by this invention person above was concretely explained based on the operation gestalt, it cannot be overemphasized that it can change variously in the range which this invention is not limited to said operation gestalt, and does not deviate from the summary.

[0035] For example, the etching prevention section may be constituted by not restricting for constituting so that the protection sheet formed with polyimide system resin may be pasted up on covering and the front face of covering may be covered

with the etching prevention section, but forming the whole covering with polyimide resin. Although cost will increase compared with the case where a protection sheet is used if the whole covering is formed with polyimide resin, contamination of the wafer by the foreign matter can be prevented.

[0036] The etching prevention section may not be restricted for forming with polyimide system resin, but may be formed with a quartz. When the etching prevention section is formed with a quartz, it is SiO<sub>2</sub> by etching. Although a foreign matter is generated, generation of the foreign matter of AlF can be prevented. To form the etching prevention section with a quartz, it is necessary to consider that spacing with a processing indoor peripheral surface becomes narrow, and the plasma becomes is easy to be formed.

[0037] Although the above explanation explained the case where invention mainly made by this invention person was applied to the dry etching technique which is a field of the invention used as the background, it is not limited to it and can apply to plasma treatment technical [ at large one, such as a plasma-CVD technique, and a plasma ashing technique, a sputtering technique, ].

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the transverse-plane sectional view showing the dry etching system which is 1 operation gestalt of this invention.

[Drawing 2] It is the expansion fragmentary sectional view of the principal part.

[Description of Notations]

1 [ -- Chamber, ] -- A wafer, 10 -- A dry etching system, 11 -- A processing room, 12 13 [ -- Counterelectrode section, ] -- An exhaust port, 14 -- An exhauster, 15 -- A closing motion valve, 16 17 [ -- Gas transfer unit, ] -- It shuts up a top side and is a ring and 18. -- An up electrode, 19 -- Gas supply opening, 20 21 [ -- Lower electrode, ] -- A gas supply way, 22 -- An RF generator, 23 -- An adjustment machine, 24 25 [ -- An adjustment machine, 30 / -- A lifting device, 31 / -- A rise-and-fall shaft, 32 / -- Bellows, 33 / -- A centrum, 34 / -- Covering, 35 / -- A protection sheet (polyimide resin system sheet), 36 / -- Guide cylinder. ] -- It shuts up a bottom side and is a ring and 26. -- A heater, 27 -- An RF generator, 28